

Key

Chapter 10 Review Problems:

1. Using the computer output that you were given in Ch. 10, look at problem #17 on page 700. This problem compares the voltage (V) and the current (I) of a metal wire for 5 wires.

a. Find the LSR line $\hat{y} = -0.0649 + 1.18445x$

- b. What is the estimate for α ? The estimate for β ? What is the estimate for σ ?

-0.0649 1.18445 $s = 0.09515$

- c. Find r and interpret

0.9935 — positive, strong, linear

- d. Find r^2 and interpret

98.7% of variation in ~~current~~ is due to

- e. Test the hypotheses that the slope is 0.

variation in ~~voltage~~ voltage.

$$t = \frac{1.18445}{0.07790} = 15.205$$

$$H_0: \beta = 0$$

$$H_a: \beta \neq 0$$

$$2 \cdot P(t > 15.205 / df = 3) = \text{~~6.18} \times 10^{-4}~~ \quad n=5$$

- ③ So as voltage increases, current changes. ① reject H_0 b/c $p\text{-value} < \alpha = 0.05$. ② Sufficient evidence that the slope of the pop. regression line is not equal to 0.

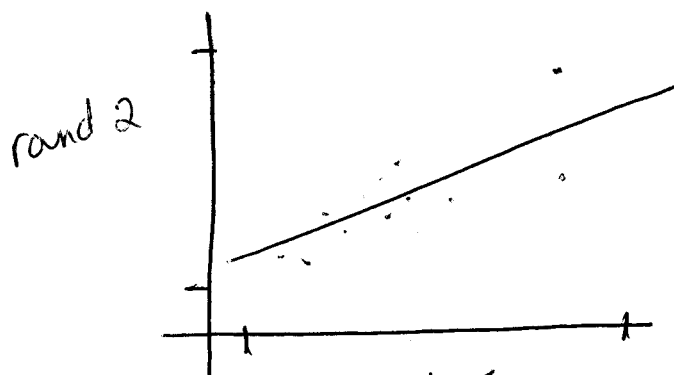
- f. Find and interpret a 95% confidence interval for the slope of the population regression line

$$1.18445 \pm (3.182)(0.07790) = (0.9365722, 1.4323278)$$

We are 95% confident that the slope of the pop. regression line btw. voltage and current is between 0.93657 and 1.432327 units/units.

2. Look at p. 706, problem #35. Using this data, and your calculator to do all calculations, answer the following questions:

a. Create a scatterplot of Round 1 versus Round 2. Describe the scatterplot.



- linear
- moderate
- positive

Assumptions

① 2 indep. SRS ① assumed

② true relationship is linear ② assumed

b. Find the LSR line, r and r^2 . Interpret r and r^2 .

$$\hat{y} = 26.332 + 0.688x$$

$$r = 0.472 \quad r^2 = 0.687$$

c. What is the estimate for α ? The estimate for β ? What is the estimate for σ ?

$$\alpha \rightarrow a = 26.332$$

$$\beta \rightarrow b = 0.688$$

$$\sigma \rightarrow s = 5.974$$

d. Test the hypotheses that the slope is 0.

$$H_0: \beta = 0$$

$$H_a: \beta > 0 \quad (\text{or } \neq 0)$$

$$t = \frac{b}{SE_b} = 2.99$$

$$P(t > 2.99 / df = 10) = 0.00678$$

- reject H_0 b/c $p\text{-value} < \alpha = 0.05$.
- suff. evid. that the slope of the pop. regr. line is greater than 0.
- Thus as round 1 scores increase, so do round 2 scores.

- e. Find and interpret a 99% confidence interval for the slope of the population regression line

$$(0.688) \pm (3.169)(0.23)$$

$b \pm t^* SE_b$

$$(-0.04087, 1.41687)$$

We are 99% conf.
that the slope of the
population regression
line between round 1 &
round 2 is btw. -0.0408
and 1.41687 pts/pts.

- f. The plot has one outlier. Remove this outlier and recompute the LSR line, r , and r^2 .

(102, 107)

$$\hat{y} = 50 + 0.4096x$$

$$r = 0.5499 \quad r^2 = 0.3024$$

- ~~g.~~ Redo the test of significance and the confidence interval. How do they change?

3. Using the computer output that you were given in Ch. 10, look at problem #39 on page 707. This problem compares the ACT and SAT scores of 60 students.

a. Find the LSR line

$$\hat{y} = 1.626 + 0.021374x$$

b. What is the estimate for α ? The estimate for β ? What is the estimate for σ ?

$$\alpha \rightarrow a = 1.626 \quad \beta \rightarrow b = 0.021374 \quad \sigma \rightarrow s = 2.744$$

c. Find r and interpret

$$0.8167$$

d. Find r^2 and interpret

$$0.667$$

e. Test the hypotheses that the slope is 0.

$$H_0: \beta = 0$$

$$H_a: \beta > 0 \quad (\text{or } \neq 0)$$

$$t = \frac{b}{SE_b} = \frac{0.021374}{0.001983} = 10.779$$

$$P(t > 10.779 \mid df = 58) = 8.95 \times 10^{-16}$$

① reject H_0 b/c $p\text{-value} < \alpha = 0.05$.

② Suff. evidence that slope of pop. regression line is greater than 0.

f. Find and interpret a 90% confidence interval for the slope of the population regression line

$$b \pm t^* SE_b$$

$$0.021374 \pm (1.671)(0.001983)$$

$$(0.0181, 0.02469)$$

we are 90% conf. that the slope of the pop. regr. line btw. ACT & SAT scores is btw. 0.0181 and 0.02469 pts/pt.

Assumptions

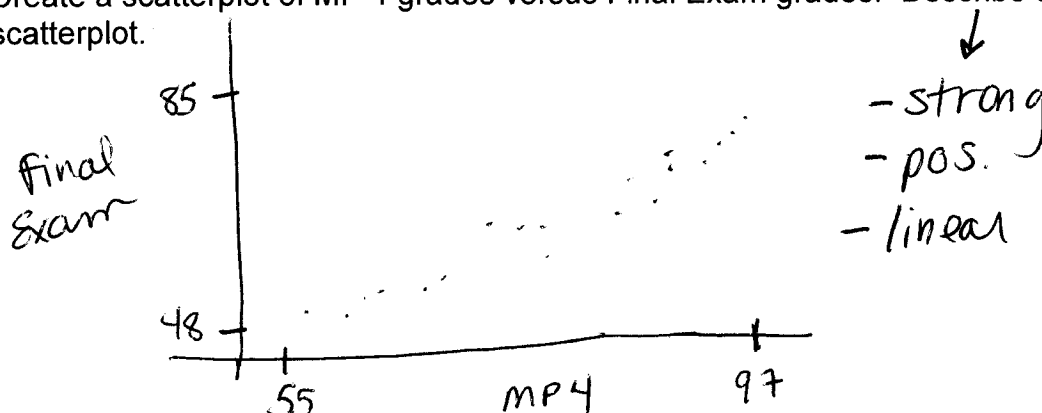
State	Check
① a indep. SRS	① assumed
② true relationship is linear	② assumed

③ Thus as SAT scores increase, ACT scores increase too.

4. The following data is a random sample of students' 4th marking period grades in an AP Stat class and their corresponding grade on the final exam for AP Stat. Using this data, and your calculator to do all calculations, answer the following questions:

Student	4th MP	Final Exam
1	85	76
2	96	80
3	75	67
4	64	52
5	55	50
6	57	51
7	89	78
8	67	55
9	88	81
10	76	69
11	59	48
12	97	85
13	91	78
14	89	68
15	82	61

- a. Create a scatterplot of MP 4 grades versus Final Exam grades. Describe the scatterplot.



- b. Find the LSR line, r and r^2 .

$$\hat{y} = 1.04 + 0.841x \quad r = 0.942 \quad r^2 = 0.8876$$

- c. What is the estimate for α ? The estimate for β ? What is the estimate for σ ?

$$a = 1.04 \quad b = 0.841 \quad s = 4.483$$

d. Test the hypotheses that the slope is 0.

$$H_0: \beta = 0$$

$$H_a: \beta > 0$$

$$t = \frac{b}{SE_b}$$

$$10.135 = \frac{0.841}{SE_b}$$

$$t = 10.135 = \frac{b}{SE_b}$$

$$P = 7.702 \times 10^{-8} = P(t > 10.135 | df = 13) \quad SE_b = 0.083$$

$$df = 13$$

① we reject H_0 b/c p-value $< \alpha = 0.05$.

② we have suff. evid. that ~~the slope of the pop. regr. line is > 0 .~~

③ Thus as 4th mp scores ↑, so do final exam scores

e. Find and interpret a 99% confidence interval for the slope of the population regression line

$$b \pm t^* \cdot SE_b$$

$$0.841 \pm (3.012)(0.083)$$

see work in (d)

$$(0.591004, 1.090996)$$

We are 99% conf. that the slope of the pop. regression line btw. MP4 + Final Exam scores is btw. 0.591004 and 1.090996 pts/pt.

f. If a student has a 71% for the 4th marking period, what would you predict for their final exam grade?

$$YI(71) = 60.72\%$$

WORK $\Rightarrow \hat{y} = 1.04 + 0.841(71) \in 60.72\%$

Assump
State Check
① 2 indep. SRS ① assumed
② true relationship is linear ② assumed